

Patent Claims

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1. Method for the continuous production of hydrolytically broken down starch derivatives that are possibly substituted, by converting with a hydrolysis agent in an aqueous medium and subsequent neutralization to stop the hydrolysis, characterized therein that a solution or suspension that contains the starch or possibly substituted starch to be hydrolyzed is continuously conveyed through a reaction stage essentially free of mixing against the force of gravity in the hydrolysis step.
 2. Method according to claim 1, characterized therein that the reaction stage has at least one tubular reactor (24 - 28) that has an inlet tube (23) disposed at the bottom and an outlet tube (25) disposed at the top when in the operative state.
 3. Method according to claim 1 or 2, characterized therein that a fine hydrolysis is carried out after the main hydrolysis according to claim 1, the roughly hydrolyzed starch solution being fed to a tubular reactor (34) with mixing elements (44) at a preset temperature during said fine hydrolysis.
 4. Method according to any one of the claims 1 to 3, characterized therein that the tubular reactors (24-28 and 34-40) are arranged essentially vertically when in operation and that the product to be hydrolyzed is conveyed from the bottom to the top.
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5. Method according to any one of the claims 1 to 4, characterized therein that the tubular reactors are tempered at a preset temperature of 25 - 100°C.
6. Method according to one or more of the claims 1 to 5, characterized therein that the main hydrolysis is carried out in the tubular tempered reactor (22) for up to 60 - 95%.
7. Method according to one or more of the claims 1 to 6, characterized therein that etherified starch, preferably a starch etherified with ethylene oxide and/or propyl oxide, especially a wax corn starch, is used.
8. Method according to claim 3, characterized therein that the fine hydrolysis is carried out with several reactors (34 - 40) provided with static mixing elements (44).
9. Method according to one or more of claims 1 to 8, characterized therein that partially broken down starch is ethoxylated continuously with ethylene oxide in a base environment, the ethoxylated product is acidified with mineral acid, the main hydrolysis is carried out at a reaction temperature of 50 - 100°C and the hydrolysis is terminated by neutralization with lye and cooling.
10. Use of the hydrolytically broken down product produced according to any one of the claims 1 to 9 as a plasma diluent or for the production of dialysis solutions.
11. Device for carrying out the method according to claim 1 having a feeding device (12) for starch solution, a container (16) for a hydrolyzing agent,

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a mixing and heating station (14) for mixing the starch solution with the hydrolyzing agent and heating the mixture to a preset temperature,
a pump arrangement (18) for feeding the mixture into at least one reactor (22),
a conduit (20) that connects all units with one another as well as a neutralization station (46) for neutralizing the mixture,

whereby the reactor (22), when in use, is arranged essentially vertically and has an inlet tube (23) at the bottom and an outlet tube (25) at the top and the pump arrangement (18) is operated in such a way that it continuously feeds the starch solution to the inlet tube (23) at the bottom at a preset pump rate, so that the starch solution is conveyed through the reactor (22) to the outlet tube (25) against the force of gravity.

12. Device according to claim 11, characterized therein that a fine hydrolysis station (32) in the form of at least one reactor unit (34 - 40) is connected in tandem after the reactor (22) as a main hydrolysis station, each of said reactor units having mixing elements (44).
13. Device according to claim 11 or 12, characterized therein that the reactors (24 - 28 and 34 - 40) are each provided with a tempering unit (27, 42).

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